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☐ 1: Breast J. 2003 May-Jun;9(3):184-91.

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- Breast J. 2003 Jul-Aug;9(4):345.

**Volatile markers of breast cancer in the breath.****Phillips M, Cataneo RN, Dittkoff BA, Fisher P, Greenberg J, Gunawardena R, Kwon CS, Rahbari-Oskoui F, Wong C.**

Menssana Research Inc., Fort Lee, New Jersey 07024, USA.

Breast cancer is accompanied by increased oxidative stress and induction of polymorphic cytochrome P-450 mixed oxidase enzymes (CYP). Both processes affect the abundance of volatile organic compounds (VOCs) in the breath because oxidative stress causes lipid peroxidation of polyunsaturated fatty acids in membranes, producing alkanes and methylalkanes which are catabolized by CYP. We performed a pilot study of breath VOCs, a potential new marker of disease in women with breast cancer. This was a combined case-control and cross-sectional study of women with abnormal mammograms scheduled for a breast biopsy. Breath samples were analyzed by gas chromatography and mass spectroscopy in order to determine the breath methylated alkane contour (BMAC), a three-dimensional display of the alveolar gradients (abundance in breath minus abundance in room air) of C4-C20 alkanes and monomethylated alkanes. BMACs in women with and without breast cancer were compared using forward stepwise discriminant analysis. Two hundred one breath samples were obtained from women with abnormal mammograms and biopsies read by two pathologists. There were 51 cases of breast cancer in 198 concordant biopsies. The breath test distinguished between women with breast cancer and healthy volunteers with a sensitivity of 94.1% (48/51) and a specificity of 73.8% (31/42) (cross-validated sensitivity 88.2% (45/51), specificity 73.8% (31/42)). Compared to women with abnormal mammograms and no cancer on biopsy, the breath test identified breast cancer with a sensitivity of 62.7% (32/51) and a specificity of 84.0% (42/50) (cross-validated sensitivity of 60.8% (31/51), specificity of 82.0% (41/50)). The negative predictive value (NPV) of a screening breath test for breast cancer was superior to a screening mammogram (99.93% versus 99.89%); the positive predictive value (PPV) of a screening mammogram was superior to a screening breath test (4.63% versus 1.29%). A breath test for markers of oxidative stress accurately identified women with breast cancer, with an NPV superior to a screening mammogram. This breath test could potentially be employed as a primary screen for breast cancer. Confirmatory studies in larger groups are required.

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